#1513442000817
BA-05-08

MEP:0509

MARTIN MARIETTA
MARTIN MARIETTA ENERGY SYSTEMS INC.

October 29, 1990

Revision 0
Revision Date:
Review Date: October, 1992

MAINTENANCE ENGINEERING PROCEDURE
K-25 SITE
OAK RIDGE, TENNESSEE 37831

TITLE: REMOVAL OF K-33 CARRIER AXIAL FLOW COMPRESSORS

A. SCOPE

This procedure describes the removal of an axial-flow stage compressor in K-33.

B. SAFETY

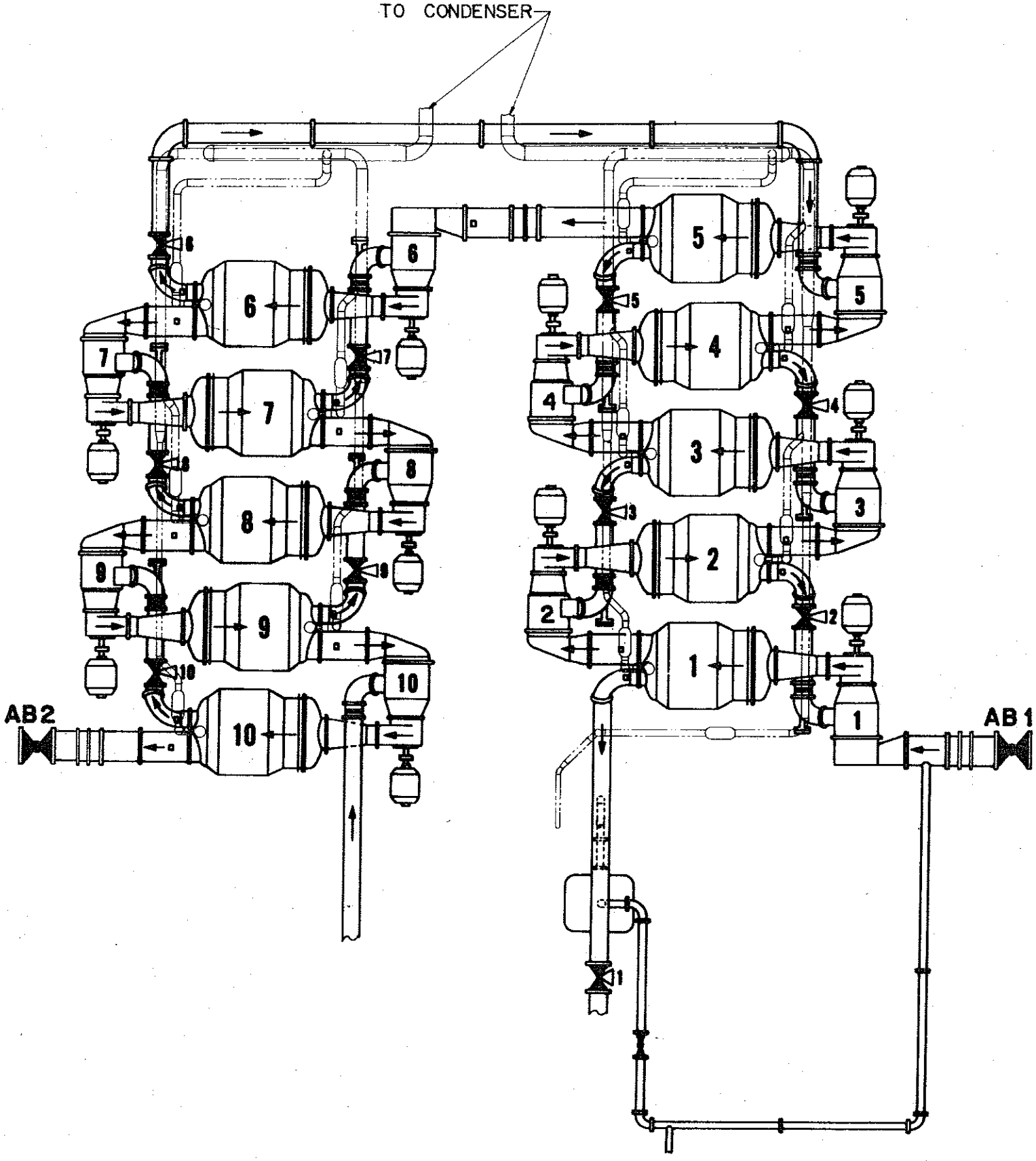
A Safety Work Permit (UCN-3694B), and an Electrical Work Permit (UCN-513) are required. The General Safe Practices listed in the K-25 Safety and Health Standards apply, with particular emphasis on the following:

Always check location on Safety Work Permit and the Electrical Work Permit against the job location.

Always wipe feet before climbing ladder to an overhead crane. Watch for oil on platform and building ladder.

This document is approved for public release per review by:
BJC ETTP Classification & Information Control Office
Date 12/1/2006

Prepared: K. R. Armstrong
Classifier: K. R. Armstrong
Approved: D. S. Gordon
Review: As a BJC ETTP Classification Office Unclassified Sensitive (U-S) Information Reviewer, I have reviewed this document and determined the document does not contain U-S information (i.e. no UCNI, ECI, or OUO information).
BJC ETTP CO U-S Reviewer/Date: 12/1/2006


TO CONDENSER
AB2
AB1
1
2
3
4
5
6
7
8
9
10

Wear respirator and protective clothing while burning flanges apart because of hot slag and gas.

Use siren on overhead crane when transferring compressor to storage or building hatch.

Wear safety goggles, respirator, and protective shield when grinding flanges on piping and compressor and any other equipment that may be required by Health Physics or Industrial Hygiene (i. e. Tyvex suit, etc.).

Allow only qualified and licensed operators to operate crane.

Keep floors free of cables, slings, and other tripping hazards.

C. QUALITY ASSURANCE

The performance and reliability of compressors affects the integrity of the cascades in both Portsmouth and Paducah as these compressors will be shipped to these facilities. Quality workmanship in the following areas is required for proper installation of axial compressors:

1. Equipment Preparation and Inspection

   Compressor piping must be prepared and inspected as described in applicable drawings, specifications, and procedures before installation. Failure to do so leads to schedule delays and failure to meet Quality and Technical Services inspections.

2. Rigging and Equipment Handling

   Failure to properly rig a compressor seriously endangers personnel or causes extensive damage to expensive cascade equipment. Personnel must have a valid operator's license before operating a crane to handle compressors (MEP:0392, "Certification of Industrial Equipment Operators").

3. Cleanliness

   a. Compressor piping must be cleaned of oil, grease, dirt, weld slag, and loose scale to meet cascade operating requirements. Presence of foreign materials in the process pipe system results in compressor de-blading the equipment replaced at Portsmouth or Paducah.

b. Since this work involves contaminated equipment, every effort should be made to minimize further contamination of the area.

1) Steps to help prevent further contamination would be to always have the area cleaned of any slag from welding or scarfing as soon as possible. Also, the entire cell area should be cleaned as soon as the compressor has been removed.

NOTE

Please notify Maintenance Engineering of any changes or errors pertaining to this procedure (4-9171).

D. GENERAL

1. K-33 compressors are part of the process line. This procedure covers the removal of compressors which are designated for shipment to other MMES facilities.

2. Always follow an acceptable method of loading, unloading, and transporting Compressors. This is extremely important for compressor safety, care, protection, expediency, and compliance with K-25 Health Physics, and criticality requirements.

E. RESPONSIBILITIES

1. Maintenance

a. Removes and installs axial compressor in K-33.

b. Contacts Operations for cleaning contamination service, if required.

c. Follows Safety, Health Physics, and Industrial Hygiene requirements.

d. Inspects the inside of compressor and PG pipe openings to assure that no foreign material is present before the compressor is prepared for shipment.

e. Assures Quality and Technical Service inspectors completes welding inspections when required.

f. Contacts Operations for cleaning contamination services, if required.

g. Follows all current applicable Industrial Hygiene requirements and procedures.

h. Assures all Health Physics concerns and requirements have been completed or provided for. All Maintenance activities concerning this procedure will be in strict compliance with all current Health Physics procedures as provided by the Health Physics Department.

2. Operations

a. Purges the cell to a negative UF6 concentration.

b. Furnishes Maintenance with Electrical (UCN-513) and Safety Work Permits (UCN-3694B) required.

c. Contacts Health Physics for consultation, advice, and placement of radiation contamination (signed and dated) tag for compressor scheduled for removal.

d. Contacts Chemical Operations group for cleaning contamination service, if required.

3. Chemical Operations Personnel

a. Cleans excessive product material from compressor and associated piping, if required. Notifies Operations and Maintenance after cleaning operation.

4. Health Physics Personnel

a. Consults with Maintenance on safe working limits for their employees.

b. Places signed and dated Radiation Contamination tags on compressor being removed from the cascade.

c. Confers with Maintenance before any work is initiated to insure all Health Physics concerns, requirements and procedures are completed or on-hand.

d. If required, a Health Physics representative will be present while the work is performed.

F. PROCEDURE

1. Material and Equipment

a. Goggles

b. Weld rod (E-7Ol6 or 7018)

c. Masking tape, 314"

d. Plastic (Rolled)

e. Welders masks

f. "U" wedges

g. Pipe jacks (24", 30")

h. Come-Along (I-ton)

i. Torch rig (oxygen and acetylene)

j. Sledge hammer - 8 lb.

k. Pry bar 5'

l. Disc grinder

m. Extension cords, 100'

n. 4-way spreader

o. Protective goggles

p. Coupling puller

q. Impact wrench

r. Choker (1/2" x 5')

s. Compressor lifting fixture

2. Preparation
(Applicable to a single compressor removal only)

NOTE

Operations personnel purges the cell to a negative UF6 concentration before permits are issued.

a. Obtain permits from Operations before starting a compressor change.

b. Remove cell hatch over from work area, using a 4-way spreader attached to an overhead crane.

c. Remove bolts from side panel of cell adjacent to compressor.

d. Remove side panel and place to one side (see Figure 2).

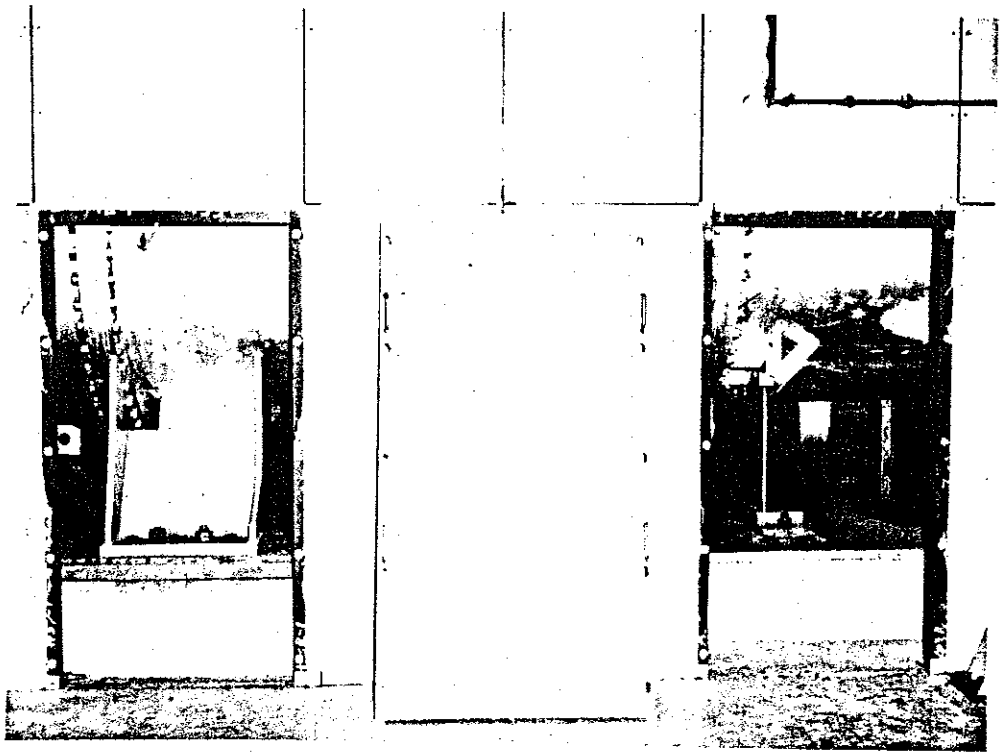


FIG. 2. CELL SIDE PANEL

e. Position and install come-along or pipe stand to support cell piping (conical) while scarfing (see Figures 3 & 4).

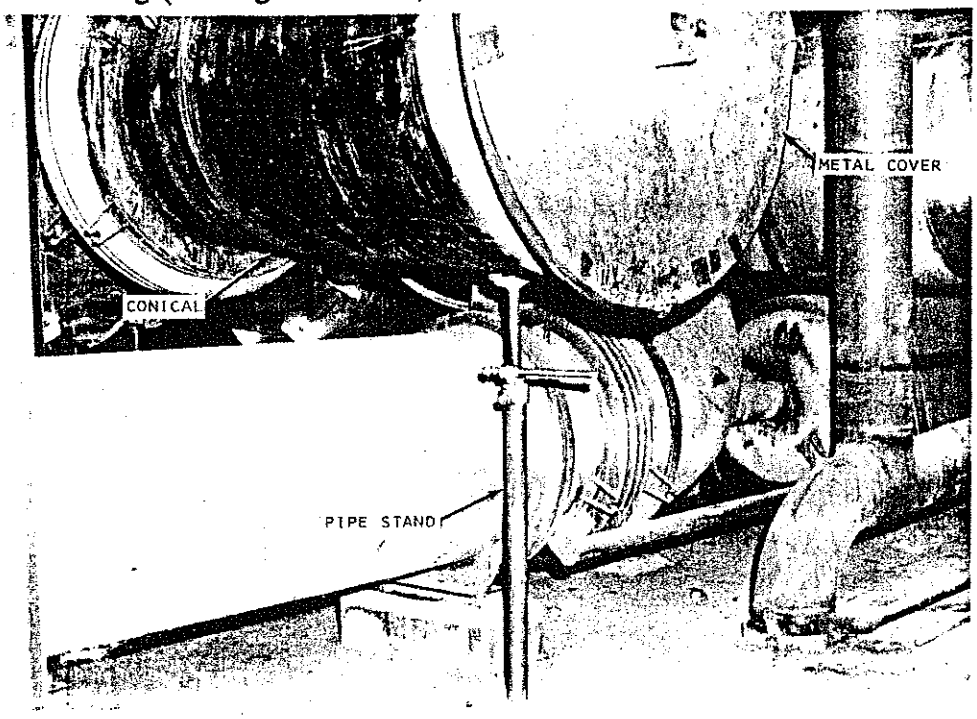


FIG. 3. CONICAL SUPPORT

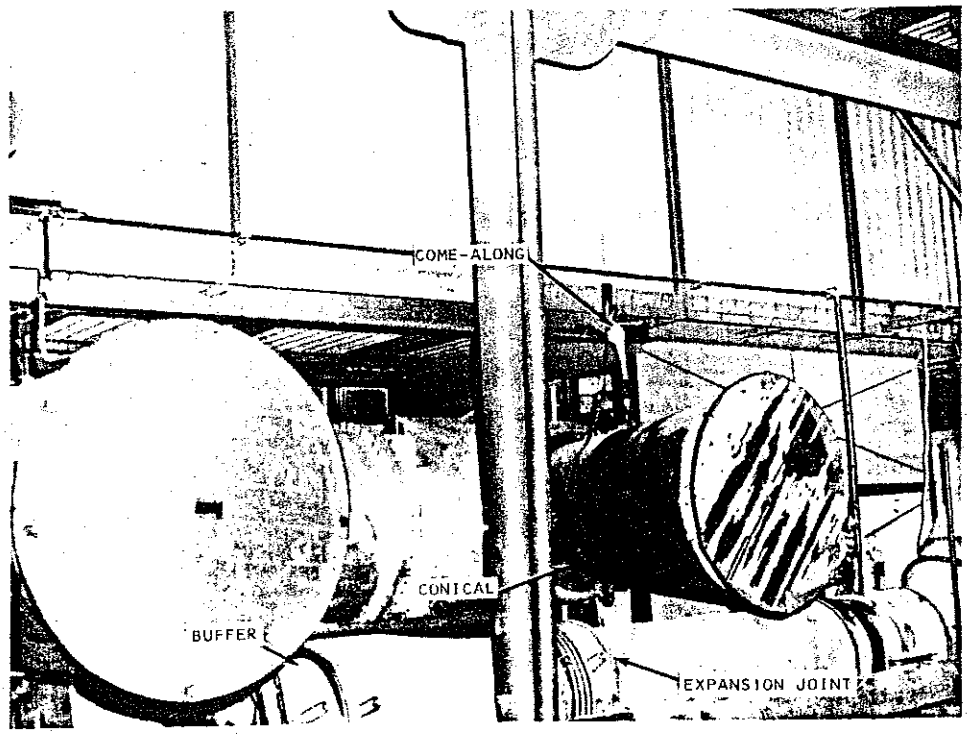


FIG. 4 COME-ALONG INSTALLATION

f. Connect arc welding machine to building outlet. Each welding machine must have enough cable for welder to move around freely without obstruction. If a building outlet is not available, a gas drive welding machine will be required with the transformers disconnected.

g. Place 6' and 8' ladders inside cell adjacent to compressor piping (conical, A-line, spool).

3. Compressor Removal

a. Remove coupling guard from over compressor coupling spool.

NOTE

Remove two bolts and disconnect two adjustable chains from coupling guard and compressor housing (see Figure 5).

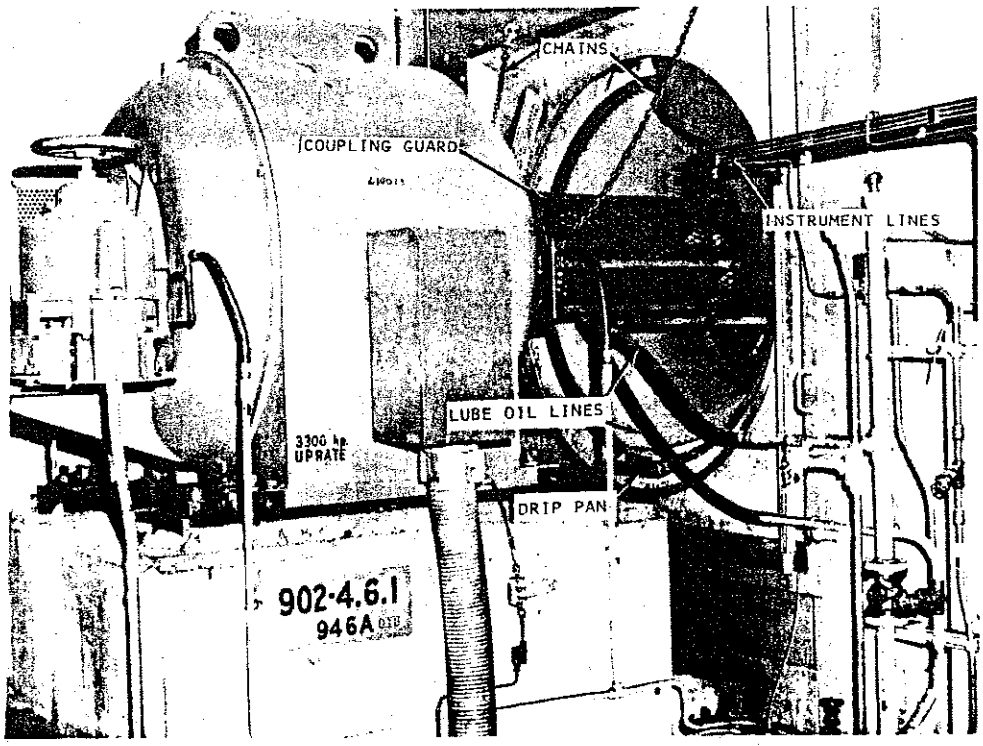


FIG. 5. COUPLING GUARD

b. Disconnect instrument lines at terminal block on thrust end of compressor. Do not remove identification tags from lines and avoid bending instrument lines (see Figure 6).

c. Disconnect and remove lube oil lines and oil drip pan at thrust end of compressor (see Figure 6).

NOTE

Do not bend oil lines 180°

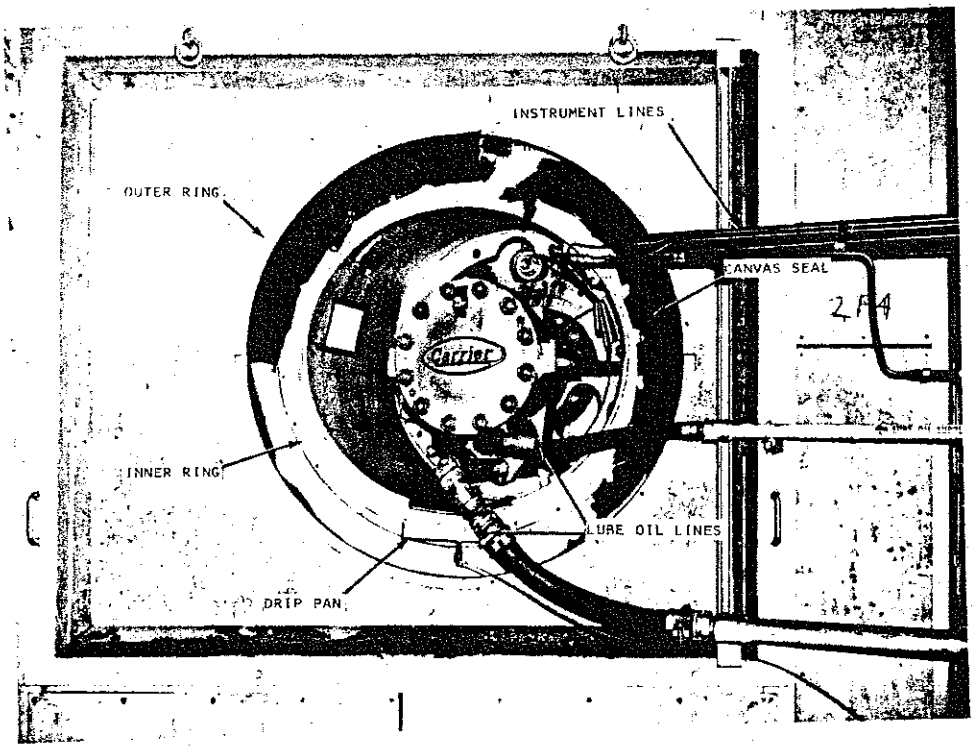


FIG. 6. INSTRUMENT AND LUBE LINES

d. Cover ends of disconnected lube oil lines with clean rags to keep dirt and foreign material out of lines.

e. Repeat step b. through d. at motor end of compressor.

f. Place clean rags in barrel of compressor under bearing housing at thrust end to catch excess oil unless portable drip pan has been installed.

g. Release magnetic motor brake.

h. Remove coupling spool between motor and compressor flanges.

NOTE

Place coupling bolts on the compressor base.

1) Attach a 1-ton come-along to compressor housing (motor end) and to coupling spool.

2) Remove bolts connecting motor drive flange to motor end flange of spool.

3) Remove shims from between faces of motor drive flange and coupling spool flange. Place one of the flange bolts through a hole in the shim pack to retain the exact position of the shims.

4) Remove only the bolts that fasten the shim pack to the compressor flange at the compressor end of the coupling spool. Leave the shim pack attached to the coupling spool.

5) Push the motor shaft back into the motor as far as it will go to allow the coupling spool bolt heads to clear the compressor flange.

6) Lower spool coupling to floor with come-along.

i. Remove compressor to-cell canvas or aluminum sheet metal seal at both ME and TE of compressor as follows:

1) Remove bolts from the outer ring.

2) Scrap canvas seals.

3) Remove outer ring.

j. Remove oil drip pan and bolts from movable section of cell housing at motor end of compressor.

k. Scarf compressor flanges with cutting torch to consume as little metal as necessary, cut three compressor flanges (A suction, B suction, discharge) in a neat and precise manner and completely sever the lines (see Figure 7).

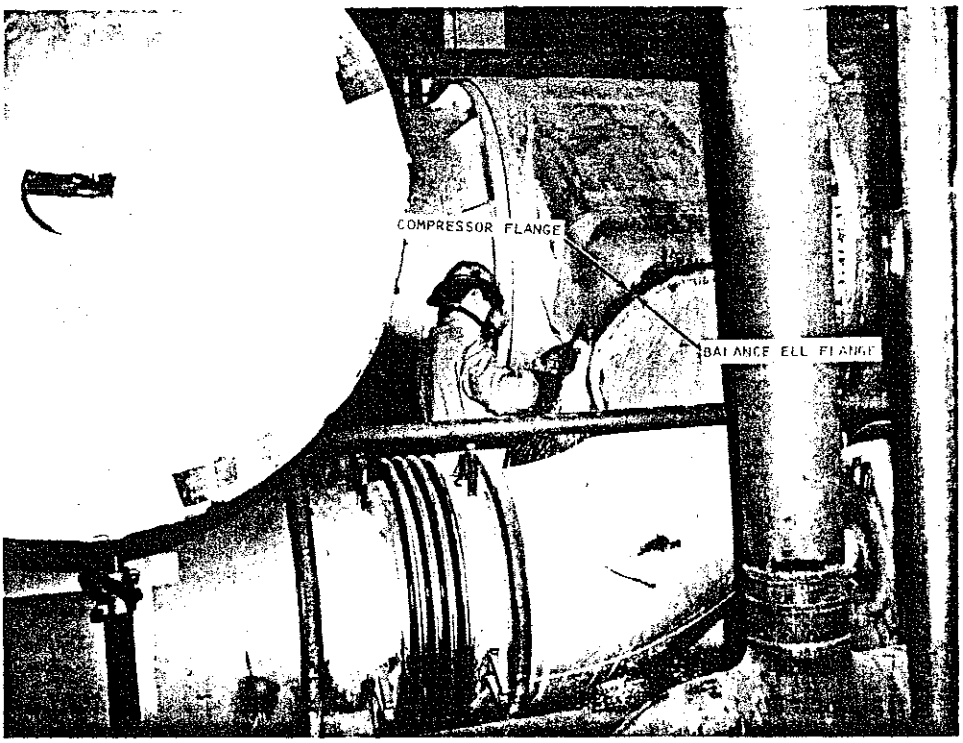


FIG. 7. SCARFING OPERATION

l. When removing a single compressor, tighten the jack bolts to compress expansion joint. This allows clearance for compressor to be removed.

m. Remove five bolts from wobble-foot support to compressor-to-floor brace. The wobble-foot remains bolted to the floor (see Figure 8), or if needed remove from the floor for shipping.

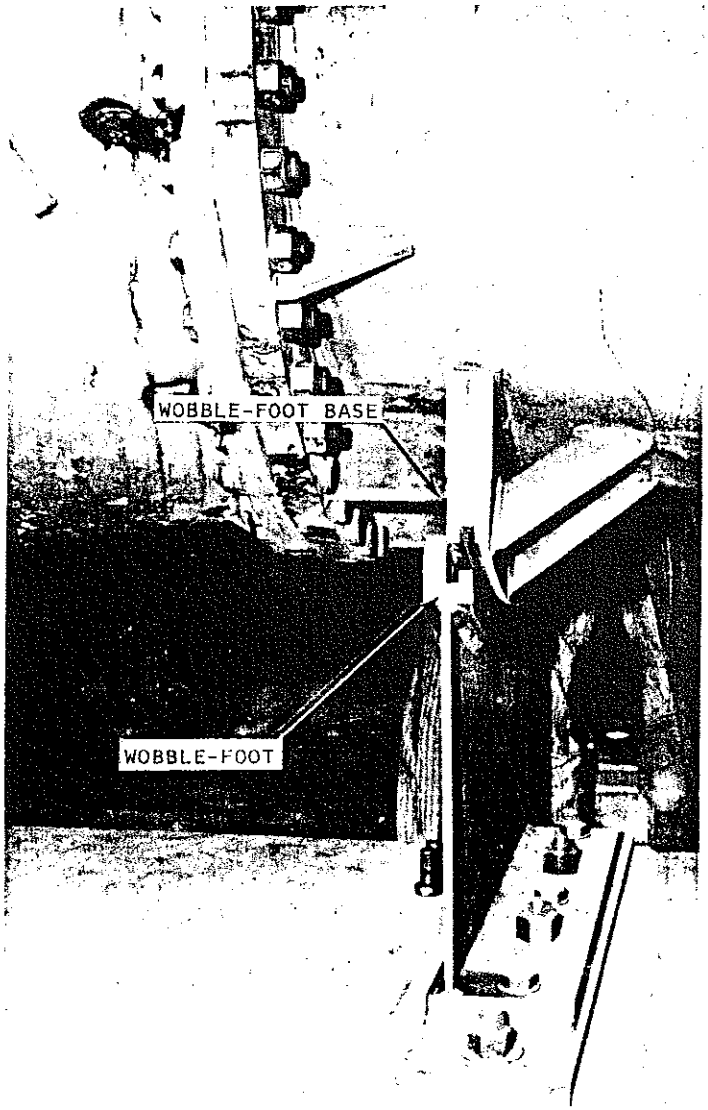


FIG. 8. WOBBLE-FOOT

n. Remove two dowel pins from base of compressor (see Figure 9).

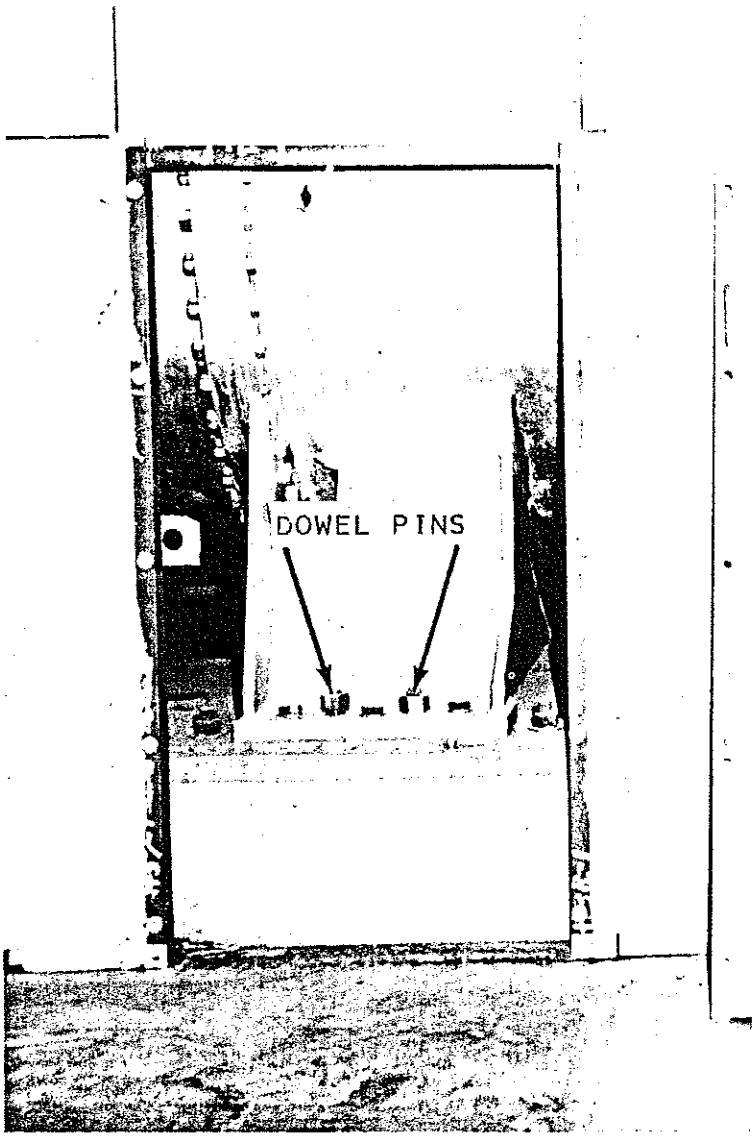


FIG. 9. DOWEL PINS

o. Remove six compressor hold-down bolts from base of compressor, three on each side (see Figure 10).

p. Disconnect the two flange instrument lines from top-center of compressor shell.

q. Remove instrument line support bracket from the center of compressor shell.

r. Position instrument bracket lines against cell housing. This ensures the compressor will clear the housing area during removal.

NOTE

Do not damage or crimp instrument lines during this step.

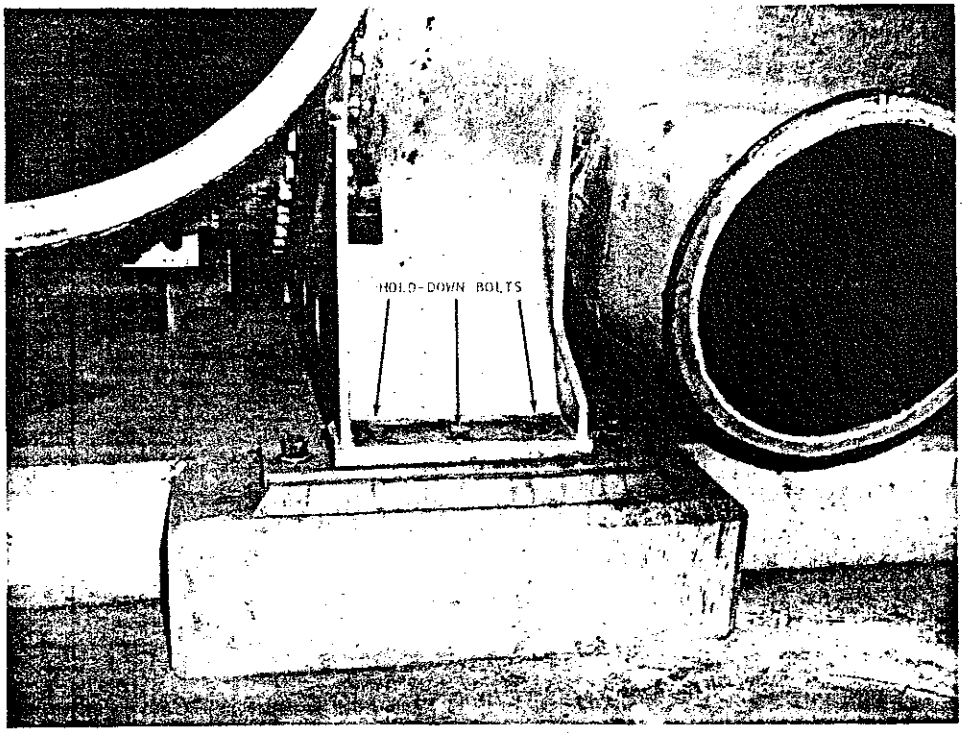


FIG. 10. HOLD-DOWN BOLTS

s. Position overhead crane above compressor.

t. Using the overhead crane with lifting fixture, attach the four-way spreader to the compressor.

1) First, attach the shortest cable to the motor end, or the volute side.

2) Second, attach the longest cable to the thrust end, opposite the volute side.

3) Then, the remaining two cables will fall naturally into position, with the short cable on the volute side and the long cable opposite the volute side.

4) When attaching the cable to the pad eye on the compressor, insert the holding pin from the top side of the pad. Then insert the cotter pin into the holding pin from the top side of the holding pin.

5) The above safety precautions improve the chances that the cable remains attached, even though the cotter pin becomes loose.

6) If the fixture is attached properly, all four spreader cables will be loaded and the compressor will ride level. If the cables were attached in the wrong sequence, they will be unevenly loaded, causing a safety hazard.

u. Carefully raise the compressor from its base high enough for installation of plastic covers. Cover the three compressor openings (nozzles) with plastic covers (see Figure 11).

v. Stand clear of cell during hoisting operation. Move compressor out of cell to bay 17, 33, or 49 for flange cleaning.

w. Position the compressor base shims on the compressor base plate and secure in place with masking tape for future use.

x. Chemical operations will clean the PG piping flanges and cover the end of the cell piping to keep pipes free of foreign material.

y. Maintenance will clean up all slag and prepare the flanges for installation of cell piping blanks.

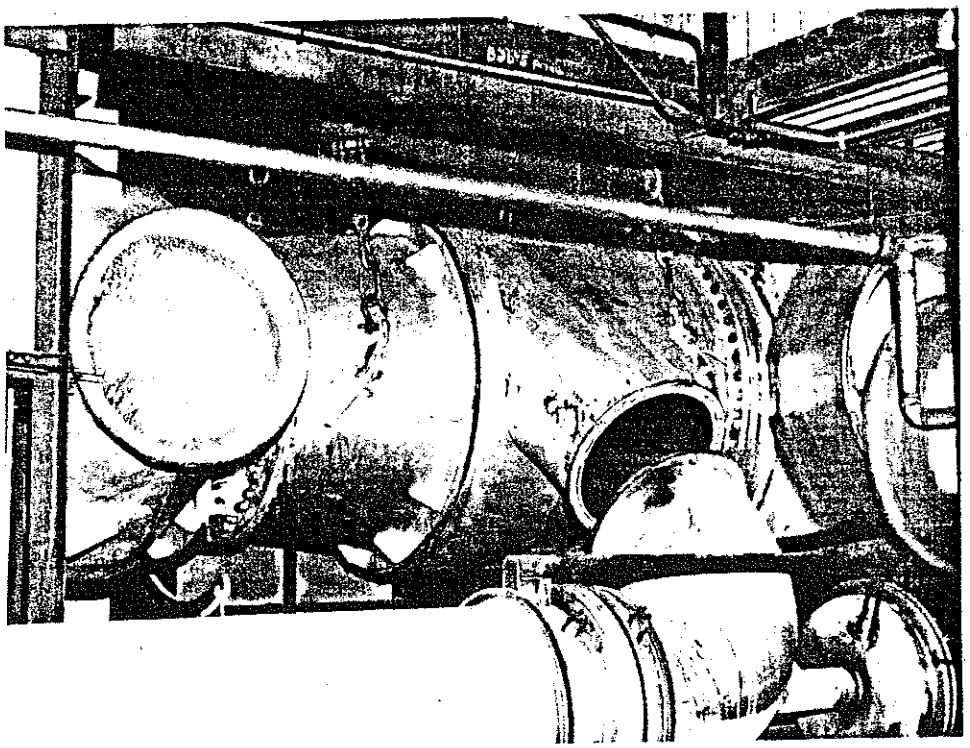


FIG. 11. PLASTIC COVERS